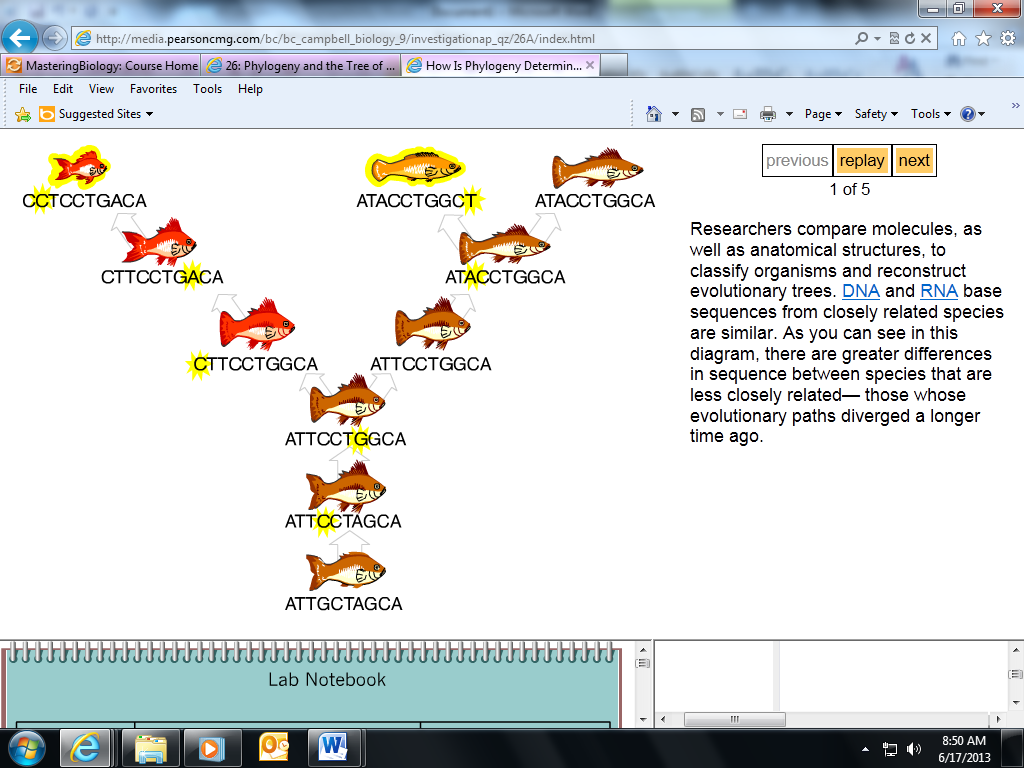
How Is Phylogeny Determined by Comparing Proteins?

Pre-Lab Question:

Explain the types of mutations that most likely account for gradual changes in the amino acid sequences of similar proteins in different organisms.



Write down the data & then draw the phylogenetic tree showing the relationships between species A,B, & C. Explain why the tree matches the data.

Write down the data & then draw the phylogenetic tree showing the relationships between species A-G. Explain why the tree matches the data.

Industry & Medicine Application

Now we will investigate the source of food poisoning bacteria identified with hamburgers sold at three restaurants. The restaurants purchased their hamburgers from three different suppliers who used meat from one meat processing plant. The restaurants and hamburger suppliers claim the bacterial contamination occurred at the meat processing plant.

To identify the source of bacterial contamination, we will use **variations in the amino acid sequence of the tryptophan synthetase A protein**. Geneticists have identified three regions of the tryptophan synthetase A gene having predictable base pair mutations. These spontaneous mutations are passed on through binary fission and are generally unique to a recent lineage of a particular bacterium. They affect the protein by substituting the amino acids on the point mutation site.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Number of differences in amino acids | | | Total number of differences in amino acids |
| Comparison | Sequence 1 | Sequence 2 | Sequence 3 |  |
| Meat Plant  Vs.  Restaurant 1 |  |  |  |  |
| Meat Plant  Vs.  Restaurant 2 |  |  |  |  |
| Meat Plant  Vs.  Restaurant 3 |  |  |  |  |
| Restaurant 1  Vs.  Restaurant 2 |  |  |  |  |
| Restaurant 1  Vs.  Restaurant 3 |  |  |  |  |
| Restaurant 2  Vs.  Restaurant 3 |  |  |  |  |

What conclusions can you make about the origins of the bacterial contamination for the three restaurants?

Why does the tryptophan synthetase A amino acid sequence differ between bacteria on hamburgers 1 and 2 if the bacteria are from the same origin?

What other types of testing can be done to confirm with little doubt the origin of the food contamination?